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U. Washington

PROGRESS REPORT 3/31/65

NASA CONTRACT NsG-401/48-002-003

PHOTOTHERMOVISCOELASTICITY RESEARCH,

The program is to develop an experimental technique whereby two-dimensional stress fields can be observed in an optical bench in viscoelastic materials subjected to thermal and external loadings. Suitable birefringent viscoelastic plastics have been developed in the laboratory and have been completely characterized in appropriate experimental facilities. The basic theoretical hypotheses have been confirmed experimentally by a sequence of experiments and this work has already been reported in the magazine Trend. A sequence of early experiments dealing with the response of typical solid propellant cross-section geometries of viscoelastic materials subjected to steady state non-linear temperature distributions have been conducted and reported verbally in February of 1965 at the A.I.A.A. meeting in Washington, D.C. The experimental program is continuing with observations of similar geometries under different temperature distributions and external loadings. All of this work has been based upon a linear theory and using thermo-rheologically simple and linear materials.

Many propellants do not exhibit linear behavior and experience large strains. Therefore, non-linear effects will be considered next. In conjunction with the use of experimental techniques, there will be parallel development of analytical procedures for the solution of the problems considered. The full details of the current status of the project will appear in the document to be submitted by the end of May, 1965, in a form which can be immediately reproducable as a Technical Note.

RJHB/cmw